

WHAT IS CLAIMED IS:

1 1. A family of chemical tags, each chemical tag comprising a core and a plurality
2 of substituents attached directly to the core, wherein the substituents of each chemical tag
3 form a subset of a closed set of possible substituents.

1 2. The family of claim 1, wherein each member of the family includes a different
2 subset of substituents.

1 3. The family of claim 1, wherein the subset of substituents includes a repeating
2 unit that is the same for all substituents of the subset.

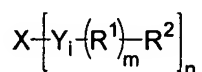
1 4. The family of claim 1, wherein the core is based on a polyhydroxy alkane.

1 5. The family of claim 4, wherein the polyhydroxy alkane is ethylene glycol,
2 propylene glycol, glycerol, pentaerythritol, or a carbohydrate.

1 6. The family of claim 1, wherein each chemical tag includes a charged or
2 ionizable moiety.

1 7. The family of claim 1, wherein each chemical tag includes a chromophore or
2 fluorophore.

1 8. The family of claim 1, wherein each chemical tag has the formula:



2
3 wherein

4 X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl,
5 alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

6 each Y is, independently, selected from the group consisting of: -CR^aR^b-, -C(O)-,
7 -S(O)-, -S(O)₂-, -O-, and -NR^a-, where each R^a and each R^b are, independently, hydrogen,
8 halo, or a substituted or unsubstituted C₁-C₆ alkyl group;

9 each i is, independently, 1, 2, 3, 4, 5 or 6;

10 each R¹ is, independently, straight chain alkylene, branched chain alkylene,
11 cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene,

heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R^1 independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

each R^2 is, independently, hydrogen or straight chain alkyl, branched chain alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl, each R^2 , independently, being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

n is an integer ranging from 1 to 10; and

each m is, independently, an integer ranging from 0 to 100.

9. The family of claim 8, wherein each Y is, independently, a group including one or more of the following moieties: $-CH_2-$, $-C(O)-$, $-NR^a-$, or $-O-$.

10. The family of claim 8, wherein all R^1 are identical in at least one $-Y_i-(R^1)_m-R^2$ group.

11. The family of claim 8, wherein each R^1 is identical in more than one $-Y_i-(R^1)_m-R^2$ group.

12. The family of claim 8, wherein n is an integer ranging from 2 to 8.

13. The family of claim 8, wherein n is 3, 4, 5 or 6.

14. The family of claim 8, wherein each R^1 is a straight chain alkyl group or a branched chain alkyl group.

15. The family of claim 14, wherein each R^2 is hydrogen.

16. The family of claim 15, wherein each Y is $-CH_2O-$; X is H_2N-CH_2-C- ; and n is 3.

17. The family of claim 8, wherein each chemical tag includes a linker group.

1 18. The family of claim 17, wherein at least one chemical tag is attached to a solid
2 support through the linker group.

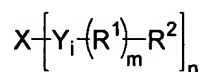
1 19. A plurality of different chemical tags each tag comprising a core and a
2 plurality of substituents attached to the core, at least one substituent including a repeating
3 unit, and each different chemical tag including the repeating unit.

1 20. The chemical tags of claim 19, wherein each tag has a mass distinguishable
2 from the mass of other tags of the plurality.

1 21. The chemical tags of claim 19, wherein the core of each tag is the same.

1 22. The chemical tags of claim 19, wherein each tag includes a different number
2 of repeating units.

1 23. The chemical tags of claim 19, wherein at least one tag has the formula:



2
3 wherein

4 X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl,
5 alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

6 each Y is, independently, selected from the group consisting of: -CR^aR^b-, -C(O)-,
7 -S(O)-, -S(O)₂-, -O-, and -NR^a-, where each R^a and each R^b are, independently, hydrogen,
8 halo, or a substituted or unsubstituted C₁-C₆ alkyl group;

9 each i is, independently, 1, 2, 3, 4, 5 or 6;

10 each R¹ is, independently, straight chain alkylene, branched chain alkylene,
11 cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene,
12 heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R¹
13 independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl,
14 cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo,
15 haloalkyl, amino, aryl, or aralkyl group;

16 each R² is, independently, hydrogen or straight chain alkyl, branched chain alkyl,
17 cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl,
18 alkynyl, aryl, aralkyl, or heteroaryl, each R², independently, being optionally substituted with

one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

n is an integer ranging from 1 to 10; and

each m is, independently, an integer ranging from 0 to 100.

24. The chemical tags of claim 23, wherein each tag has a different total m.

25. The chemical tags of claim 23, wherein each Y is, independently, a group including one or more of the following moieties: -CH₂-, -C(O)-, -NR^a-, or -O-.

26. The chemical tags of claim 23, wherein each R¹ is identical in at least one $-\text{Y}_i(\text{R}^1)_m\text{R}^2$ group.

27. The chemical tags of claim 23, wherein each R¹ is identical in more than one $-\text{Y}_i(\text{R}^1)_m\text{R}^2$ group.

28. The chemical tags of claim 23, wherein n is an integer ranging from 2 to 8.

29. The chemical tags of claim 23, wherein n is 3, 4, 5 or 6.

30. The chemical tags of claim 23, wherein each R¹ is a straight chain alkyl group or a branched chain alkyl group.

31. The chemical tags of claim 23, wherein each R¹ is -CH₂- and each R² is hydrogen.

32. The chemical tags of claim 23, wherein each tag has a mass distinguishable from the mass of from other tags of the plurality.

33. A method of making a chemical tag comprising:
selecting a subset of substituents from a closed set of possible substituents; and
attaching each substituent of the subset directly to a core.

34. The method of claim 33, wherein the subset includes at least two substituents.

1 35. The method of claim 33, wherein at least one substituent in the closed set of
2 possible substituents includes a repeating unit.

1 36. The method of claim 33, further comprising attaching a linker group to the
2 core.

1 37. The method of claim 36, further comprising attaching the tag to a solid
2 support through the linker group.

1 38. A method of making a family of chemical tags, comprising:
2 selecting a first subset of substituents and a second subset of substituents from a
3 closed set of possible substituents;
4 attaching each substituent of the first subset directly to a first core; and
5 attaching each substituent of the second subset directly to a second core.

1 39. The method of claim 38, wherein at least one substituent in the closed set of
2 possible substituents includes a repeating unit.

1 40. The method of claim 39, wherein the first subset and the second subset
2 include different numbers of repeating units.

1 41. A method of tracking an object comprising:
2 associating a chemical tag with an object, wherein the chemical tag includes a core
3 and a plurality of substituents attached directly to the core, wherein the substituents of each
4 chemical tag form a subset of a closed set of possible substituents;
5 identifying the tag; and
6 correlating the identity of the chemical tag with the object.

1 42. The method of claim 41, wherein associating includes attaching the tag to the
2 object.

1 43. The method of claim 41, wherein identifying includes separating the tag from
2 the object.

44. The method of claim 41, wherein identifying includes determining a mass of the tag.

45. The method of claim 41, wherein identifying includes determining a chromatographic retention time of the tag.

46. The method of claim 41, further comprising associating a second chemical tag with the object.

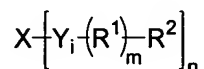
47. The method of claim 46, further comprising identifying the second chemical tag.

48. The method of claim 41, further comprising chemically transforming the object before or after associating the chemical tag with the object.

49. The method of claim 41, wherein the object includes a support for solid phase synthesis.

50. The method of claim 49, wherein the support is attached to a member of a library of compounds.

51. The method of claim 41, wherein the tag has the formula:



wherein

X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

each Y is, independently, selected from the group consisting of: -CR^aR^b-, -C(O)-, -S(O)-, -S(O)₂-, -O-, and -NR^a-, where each R^a and each R^b are, independently, hydrogen, halo, or a substituted or unsubstituted C₁-C₆ alkyl group;

each i is, independently, 1, 2, 3, 4, 5 or 6;

each R¹ is, independently, straight chain alkylene, branched chain alkylene, cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene, heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R¹ independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl,

cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

each R² is, independently, hydrogen or straight chain alkyl, branched chain alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl, each R², independently, being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

n is an integer ranging from 1 to 10; and

each m is, independently, an integer ranging from 0 to 100.

52. A method of tracking an object comprising:

associating a plurality of different chemical tags with a plurality of objects, wherein each different chemical tag includes a core and a plurality of substituents attached directly to the core, at least one of the substituents including a repeating unit, each different tag including the repeating unit;

determining the identity of an individual tag of the plurality of tags; and

correlating the identity of the individual tag with an object of the plurality of objects.

53. The method of claim 52, wherein associating includes attaching the plurality of different chemical tags to the object.

54. The method of claim 52, wherein identifying includes separating the plurality of different chemical tags from the object.

55. The method of claim 52, wherein identifying includes determining a mass of each of the different chemical tags.

56. The method of claim 52, wherein identifying includes determining a chromatographic retention time of each of the different chemical tags.

57. The method of claim 52, wherein the object includes a support for solid phase synthesis.

1 58. The method of claim 57, wherein the support is attached to a member of a
2 library of compounds.